

REPORT DOCUMENTATION PAGE					Form Approved OMB No. 0704-0188	
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1. REPORT DATE (DD-MM-YYYY) 20/08/2018		2. REPORT TYPE Poster		3. DATES COVERED (From - To) 08/20-23/2018		
4. TITLE AND SUBTITLE Effects of Temperature Correction on Key Arterial Blood Gas Measures in a Combat Relevant Trauma Model Treated with Therapeutic Hypothermia: Implications for Prolonged Field Care				5a. CONTRACT NUMBER		
				5b. GRANT NUMBER		
				5c. PROGRAM ELEMENT NUMBER		
6. AUTHOR(S) Lt Col Sams, Valerie G				5d. PROJECT NUMBER		
				5e. TASK NUMBER		
				5f. WORK UNIT NUMBER		
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) 59th Clinical Investigations and Research Support 1100 Wilford Hall Loop, Bldg 4430 JBSA – Lackland, TX 78236-9908 210-292-7141				8. PERFORMING ORGANIZATION REPORT NUMBER 18008		
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) 59th Clinical Investigations and Research Support 1100 Wilford Hall Loop, Bldg 4430 JBSA – Lackland, TX 78236-9908 210-292-7141				10. SPONSOR/MONITOR'S ACRONYM(S)		
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)		
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release. Distribution is unlimited.						
13. SUPPLEMENTARY NOTES MHSRS 2018, Kissimmee, FL 20-23 Aug 2018						
14. ABSTRACT						
15. SUBJECT TERMS						
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON	
a. REPORT	b. ABSTRACT	c. THIS PAGE			SSgt Erin Toth	
					19b. TELEPHONE NUMBER (Include area code) 210-292-7141	

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Effects of Temperature Correction on Arterial Blood Gas Values in a Combat Relevant Model of Lung Injury Treated with Therapeutic Hypothermia: Implications for Prolonged Field Care

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Introduction

Therapeutic hypothermia may be beneficial in preventing reperfusion related damage after trauma

Blood gas analysis is crucial for the monitoring of patients after lung injury

Standard arterial blood gas analysis involves heating of arterial blood to a reference physiological temperature of 37°C

Algorithms in blood gas analyzers can mathematically calculate the patient's blood gas at actual body temperature from the standard 37°C temperature blood gas value

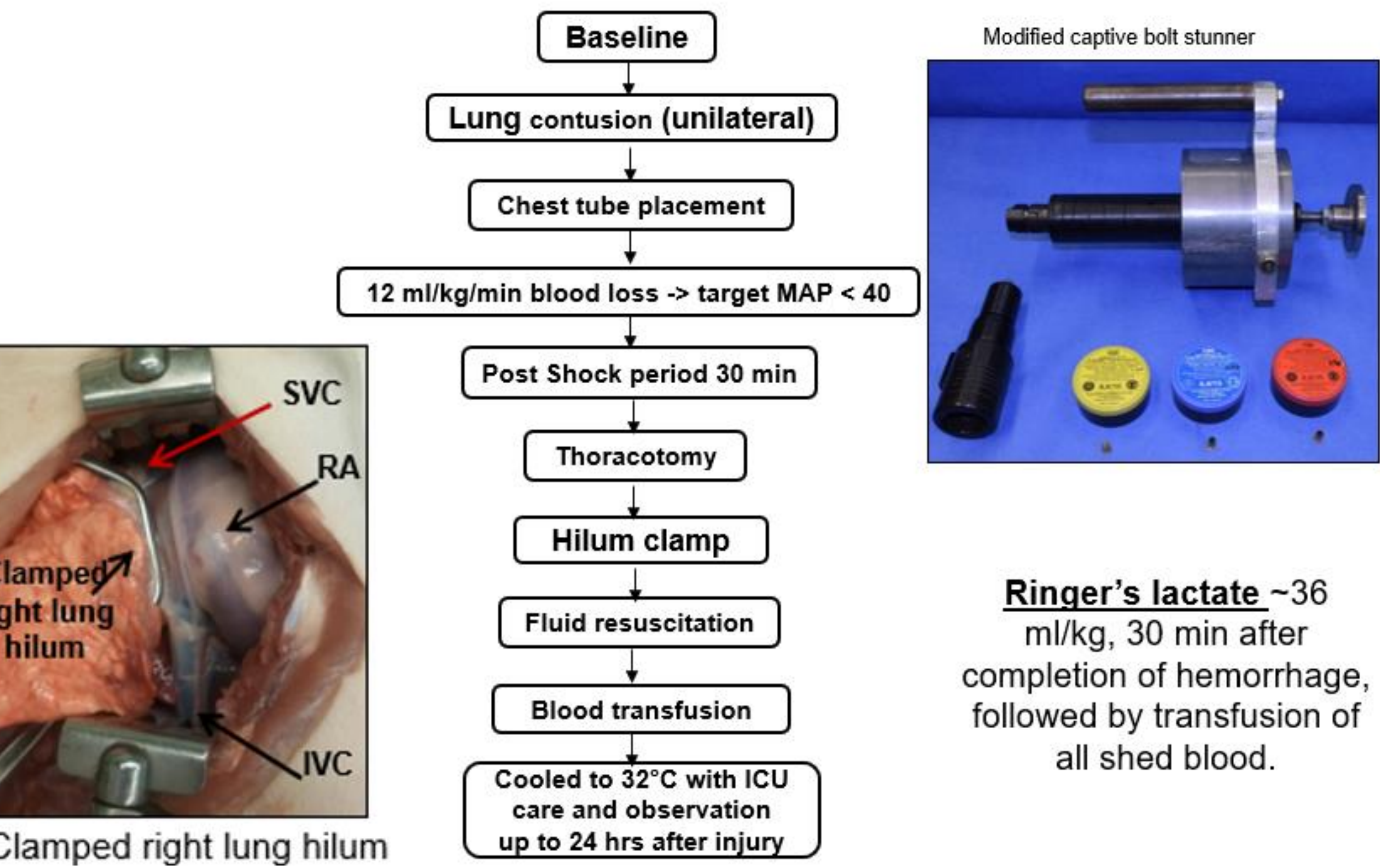
Objective

We hypothesized that point-of-care blood gas analysis of hypothermic patients provides a systematic under estimation of values for pO₂ and pCO₂ compared to reference temperature

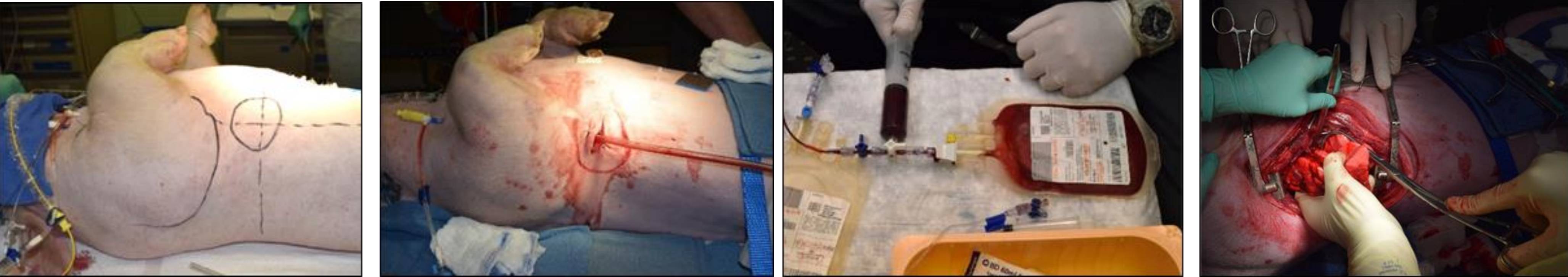
Methods

The temperature corrected and the 37°C arterial blood gases were recorded at Baseline, post-Shock, post-Pneumonectomy, post-Transfusion, and every 6 hours after transfusion using i-STAT point of care blood gas analyzers (Abbott, Abbott Park, IL).

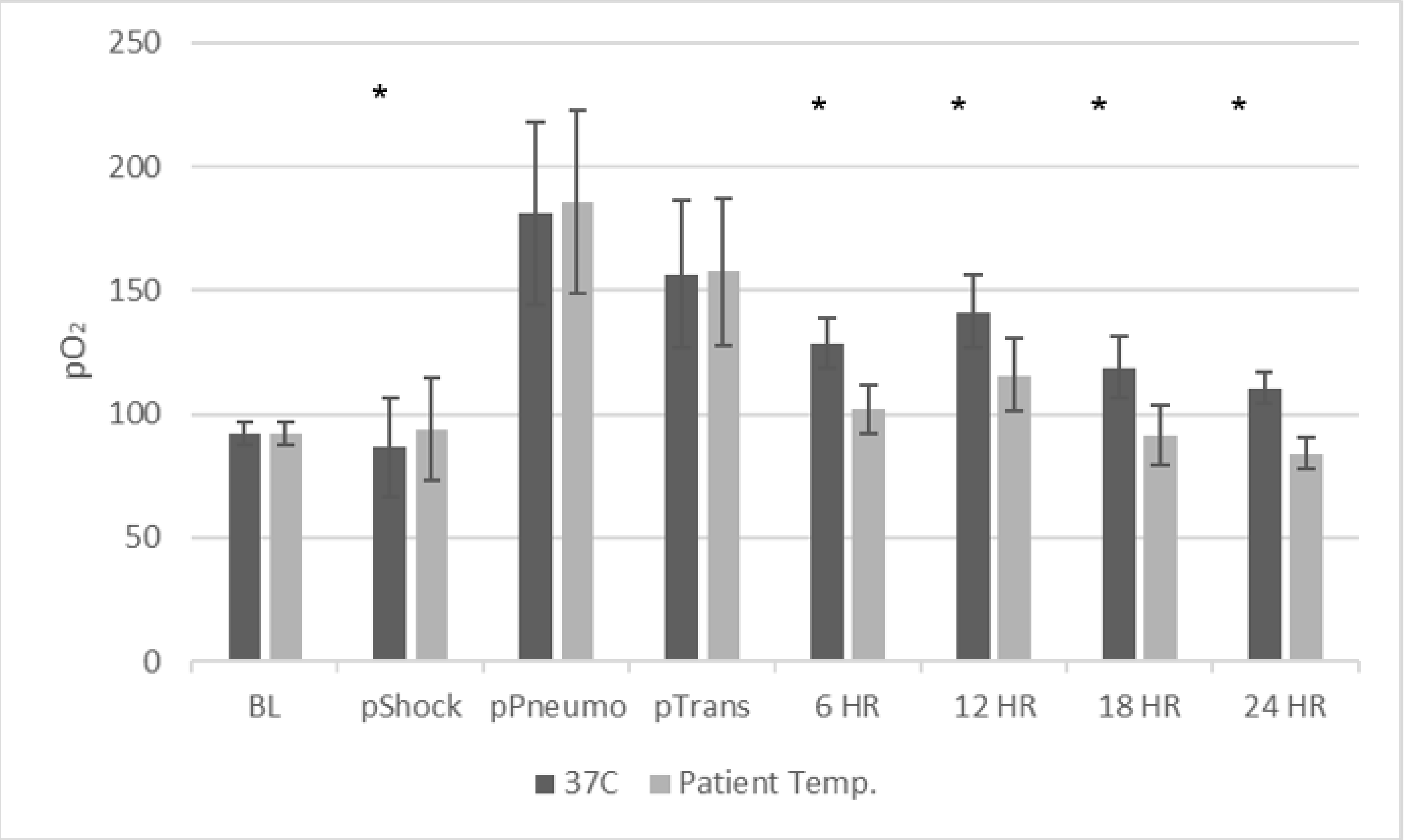
8 female swine (sus scrofa domestica), mean body weight 54±7 kg



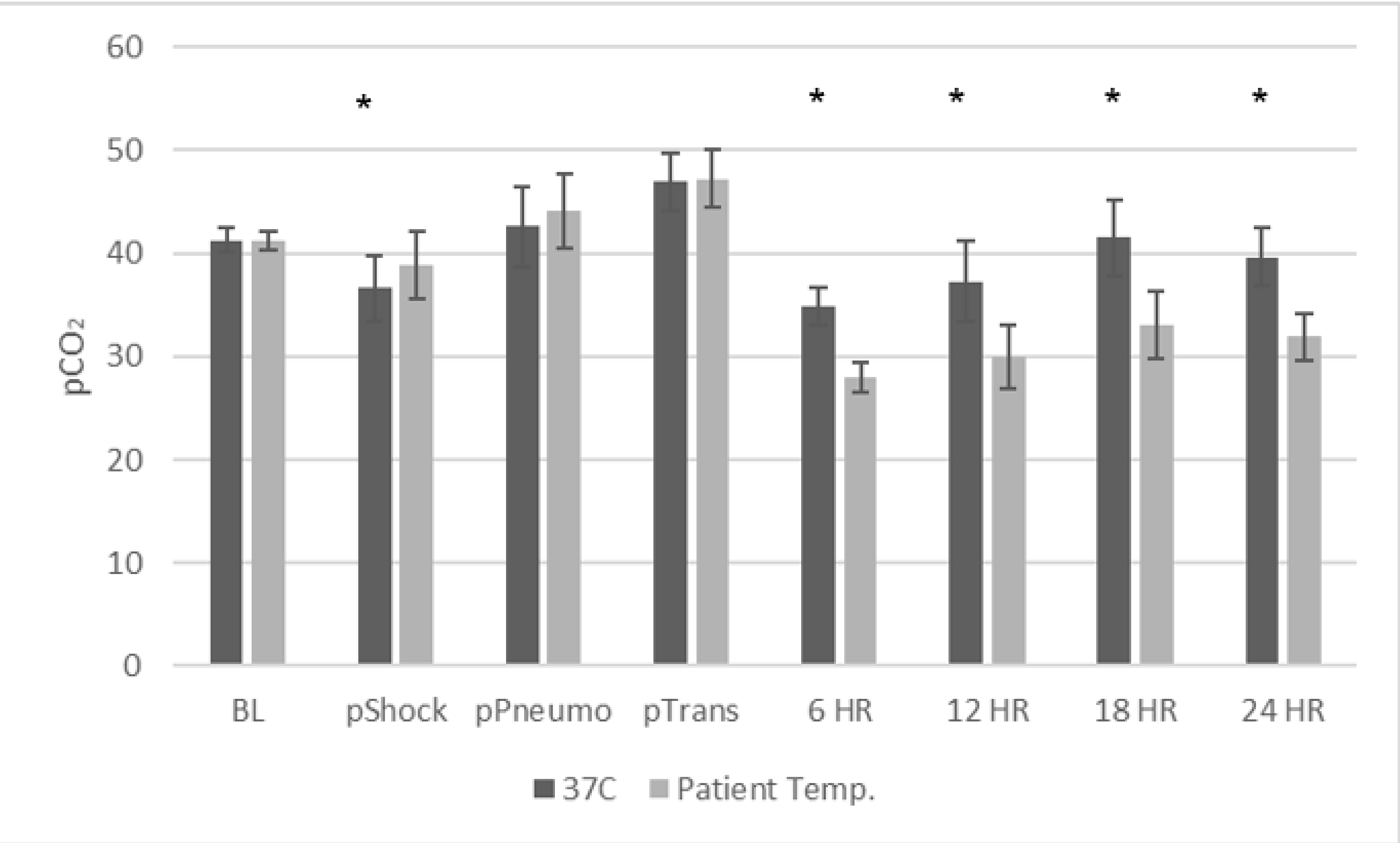
Statistical analysis by SAS, 9.4, Cary, NC. (p<0.5), data presented as means±SEM, statistics by Kruskal-Wallis test with a Dunnett adjustment



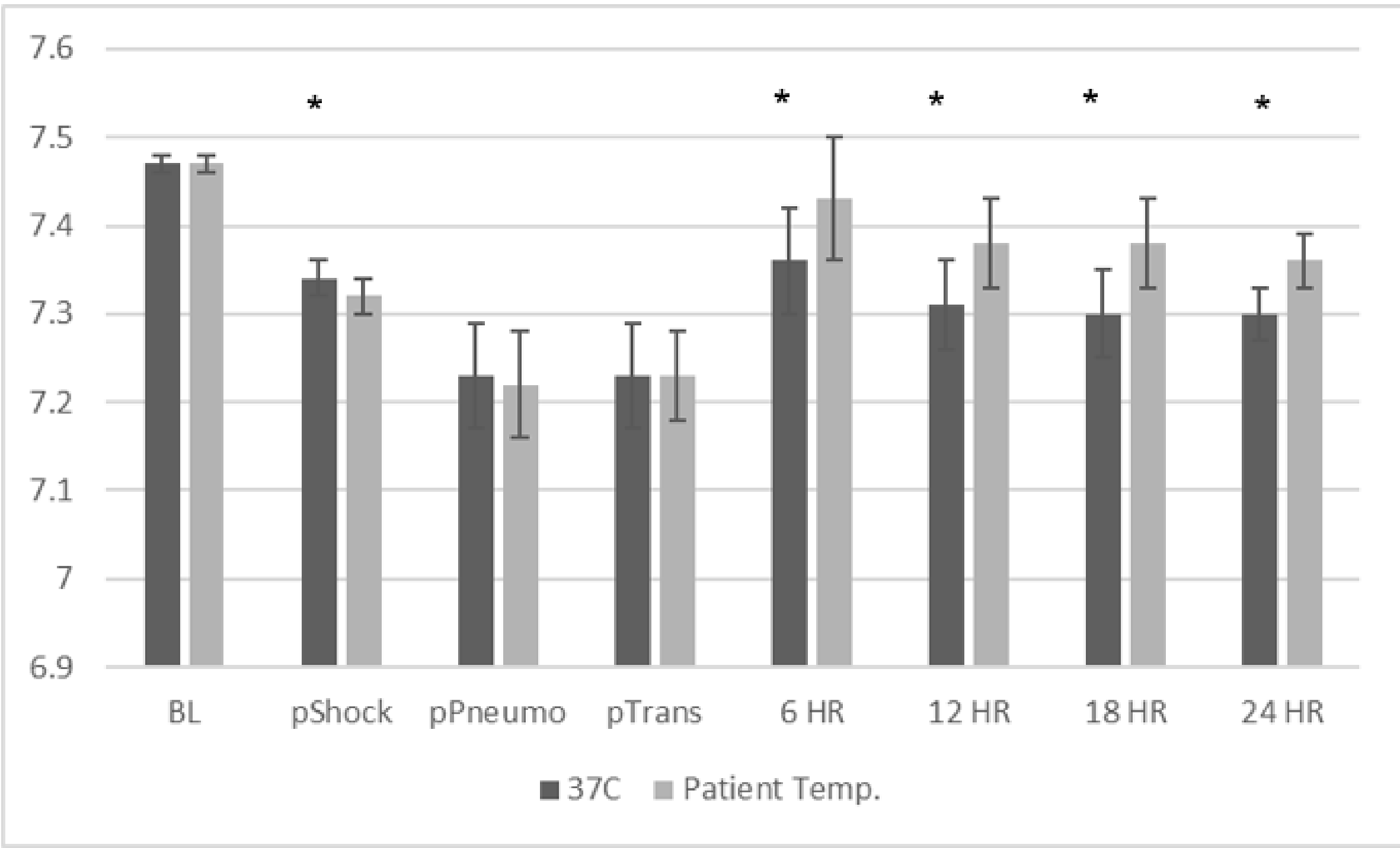
Results								
	BL	pShock	pPneumo	pTrans	6	12	18	24
Patient Temp.	37±0.37	38.4±0.27	37.9±0.47	37.2±0.35	32.0±0.03	31.9±0.09	31.7±0.22	32.1±0.11



*Significant difference (p<0.5) between 37°C and patient-temperature corrected values, data presented as means±SEM, statistics by Kruskal-Wallis test with a Dunnett adjustment



*Significant difference (p<0.5) between 37°C and patient-temperature corrected values, data presented as means±SEM, statistics by Kruskal-Wallis test with a Dunnett adjustment



*Significant difference (p<0.5) between 37°C and patient-temperature corrected pH values, data presented as means±SEM, statistics by Kruskal-Wallis test with a Dunnett adjustment

Conclusion

Blood gas analysis during Therapeutic Hypothermia at 32°C showed a systematic underestimation of pO₂ values by about 22-26 mm Hg

The effects on pH and pCO₂ were although significant statistically but clinically of less potential impact

The patient-temperature corrected blood gas values are crucial for monitoring patients treated with TH suggesting that new nomograms for temperature correction should be developed to include commonly used therapeutic targets recommended for specific Therapeutic Hypothermia protocols

Acknowledgements

This study was funded by the United States Air Force, and administered through the 59th MDW via The Geneva Foundation under Contract #FA8650-15-C-6692, PI: Dr. Andriy Batchinsky, MD. The experiments reported herein were conducted according to the principles set forth in the National Institute of Health Publication No. 80-23, Guide for the Care and Use of Laboratory Animals and the Animal Welfare Act of 1966, as amended.